Margarita M. Solares-Colón

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Seismologist & Geodesist

PhD candidate in earthquake science (graduating 2025) with expertise in geophysical data analysis, seismic network operations, and rupture modeling using seismic and GNSS data. Trained during an active seismic sequence, gaining firsthand experience in earthquake response and a deep understanding of its urgency. Committed to improving response workflows and decision-making, with a strong interest in analyzing geophysical datasets and a strength in turning technical results into impactful visualizations. Fluent in: English and Spanish.

RESEARCH INTERESTS

Geophysics, earthquake seismology, kinematics and dynamics of plate tectonics, geological hazards risks and management

EDUCATION

Ph.D. in Earth Sciences, University of Oregon, Eugene (expected 2025). Dissertation: "Modeling Moderate to Large Earthquakes: Applications in Source Characterization and Early Warning Systems", Advisor: Dr. Diego Melgar-Moctezuma

M.S. in Geology, University of Puerto Rico, Mayagüez (2019). Thesis: "New Constraints on Crustal Deformation Within the Puerto Rico–Virgin Islands Microplate with Two Decades of GPS Data", Advisor: Dr. Alberto López-Venegas

Graduate-level Professional Development, University of Puerto Rico, Mayagüez (2013). Completed additional coursework equivalent to a B.S. in Geology

B.A. in Physical Geography and Technology Applications (GIS and Remote Sensing), University of Puerto Rico, Río Piedras (2012). Magna Cum Laude. Research: "Impact on Karst Zone, Arecibo, Puerto Rico: Land Use and Soil Classification Using Remote Sensing". Advisor: Ángel David Cruz-Báez

ACADEMIC AND PROFESSIONAL EXPERIENCE

Pathways Intern | U.S. Geological Survey, Golden, Colorado **Jun 2022 – Sep 2023**
Supervisors: Dara Goldberg and William Yeck
37.5 hours per week

- Contributed to improving the National Earthquake Information Center (NEIC) finite-fault model database by integrating seismic and geodetic observations for major global earthquake events.
- Learned, applied, and adapted the Wavelet and simulated Annealing SliP (WASP) code to develop and refine finite-fault models, with outcomes integrated into my doctoral dissertation research.

Research Assistant I | Puerto Rico Seismic Network, Geology-UPRM **Nov 2019 – Jul 2021**
Supervisor: Victor Huérfano and/or Gisela Báez
37.5 hours per week

- Data analyst reviewing and processing geophysical data for local and regional earthquakes detected by seismic stations monitored by the Puerto Rico Seismic Network.

- Preparing and disseminating reports and messages of earthquakes felt in Puerto Rico and tsunamis for Puerto Rico and adjacent regions in our area of responsibility.
- Collaborating in current investigations of interest and operational projects of the GPS Network maintenance and Advanced National Seismic System (ANSS) Quake Monitoring System (AQMS) integration to our operations.

Technical Translator | UNAVCO, Inc. **Dec 2017 – Dec 2020**
Supervisors: Karl Feaux, Beth Bartel, Beth Pratt-Sitaula

- Translated scientific video scripts, abstracts or surveys for educational purposes on geoscience topics from English to Spanish (8 to 18 hours to complete tasks).
- Translated the National Science Foundation (NSF) Final Workshop Report for the COCONet Community Workshop (Punta Cana, May 2016; 70 hours to complete task).

Teaching Assistant | Geology-UPRM **Aug 2018 – Dec 2018; Aug 2013 – May 2016**
Supervisor: Dr. James Joyce
2-3 sections of 2.5 hours a week

- Instructed an undergraduate course (Geology for Engineers - GEOL 4015) leading laboratory sessions, planning classes, grading, and office hours.

Lecturer Assistant | Geosistemas, Inc. **Sep 2013; Sep 2011**
Supervisor: Dr. José Molinelli
3-day sessions Google Earth Workshop for Public School Teachers in Puerto Rico

- Guided participants during the Google Earth workshop for public school teachers in Puerto Rico to complete 12 to 21 modules on how to use this program and integrate them into their classrooms.

GIS Technician | Geographic Mapping Technologies, Corp. **Nov 2011**
Supervisor: Glenda Román

- Assisted in a GIS project for upgrading and designing a company transportation route using ArcGIS.

Intern | Junta de Planificación de Puerto Rico **Aug 2011 – Dec 2011**

- Updated zoning and land use classifications and created maps using ArcGIS at the PUT (Plan de usos de terreno - land use and management) division.

PUBLICATIONS

Solares-Colón, M. M., Melgar, D., et al. (2025; *work submitted to Seismica*). Using ruptures from earthquake cycle simulators to test geodetic early warning systems performance

Solares-Colón, M. M., Goldberg, D. E., Melgar, D., Vanacore, E. A., Sahakian, V. J., Yeck, W. L., & López-Venegas, A. M. (2025). Slow rupture, long rise times, and multi-fault geometry: The 2020 M6.4 southwestern Puerto Rico mainshock. Geophysical Research Letters, 52. https://doi.org/10.1029/2024GL109740

López-Venegas, A. M., Mattioli, G. S., **Solares-Colón, M.,** Mencin, D., & Jansma, P. E. (2023). Estimating coseismic deformation of southwestern Puerto Rico from the 7 January 2020 Mw 6.4 earthquake: Constraints from campaign and continuous GPS. Bulletin of the Seismological Society of America, 113(1), 99–114. https://doi.org/10.1785/0120220115

HONORS

Recipient, Graduate School Promising Scholar, University of Oregon, 2021-2022

SELECTED CONFERENCES

Apr 2025 **European Geophysical Union (EGU) General Assembly, Vienna, Austria**
Poster Presentation "Towards systematic kinematic source models of historically large earthquakes".

Apr 2023 **Seismological Society of America (SSA) Annual Meeting, San Juan, Puerto Rico**
Poster Presentation "The M6.4 Mainshock in the 2020 Southwestern Puerto Rico Seismic Sequence: New insights from Joint Inversion".
(Received SSA Travel Grant to cover travel expenses)

Dec 2022 **American Geophysical Union (AGU) Fall Meeting, Chicago, IL**
Oral Presentation "Source Characterization of the M6.4 Mainshock in the 2020 Southwestern Puerto Rico Seismic Sequence with Seismic and Geodetic Observations".

Apr 2022 **Seismological Society of America (SSA) Annual Meeting, Bellevue, WA**
Poster Presentation "Generation and Validation of Synthetic HR-GNSS Data for New Zealand Megathrust Rupture Scenarios".

Dec 2018 **American Geophysical Union (AGU) Fall Meeting, Washington, DC**
Poster Presentation "Quantifying Rigidity of the Puerto Rico-Virgin Islands Block Using Two Decades of GPS Observations".
(Received AGU Fall Meeting General Student Travel Grant to cover travel expenses)

Dec 2015 **American Geophysical Union (AGU) Fall Meeting, San Francisco, CA**
Poster Presentation "New GPS Constraints on Crustal Deformation within the Puerto Rico-Virgin Islands Microplate".
(Received AGU Fall Meeting General Student Travel Grant to cover travel expenses)

Oct 2010 **Race, Ethnicity, and Place – V Conference, Binghamton, NY**
Poster Presentation "Tourist Impact and Development on the island of Culebra". Conference organized by the State University of New York.

Sep 2009 **Annual Meeting: National Conference on Geography Education**
Volunteer with the Department of Geography, University of Puerto Rico, Río Piedras

WORKSHOPS

May 2025 **Seafloor Geodesy Future PI Workshop, Bloomington, MN**
Introduction to preparing early career researchers to design and propose seafloor geodetic experiments. Organized by Andy Newman (Georgia Tech), Noel Jackson (Univ. Kansas), Sparh Webb (Columbia Univ./LDEO), John DeSanto (Univ. Washington), and Melissa Weber (EarthScope Consortium).

Oct 2024 **Earthquakes: Nucleation, Triggering, Rupture, and Relationships to Aseismic Processes – 4th Edition, Cargèse, Corsica, France**

International workshop on earthquakes combined lectures by leading researchers with tutorials and group discussions on fault mechanics, seismic/aseismic interactions, and seismic hazard organized by Anthony Sladen (Univ. Côte d'Azur, CNRS), Mathilde Radiguet (Univ. Grenoble Alpes, CNAP), Thea Ragon (Univ. Grenoble Alpes, CNRS), Yihe Huang (Univ. Michigan, USA), Jean-Paul Ampuero (Univ. Côte d'Azur, IRD), Alice Gabriel (Univ. California San Diego), and Aitaro Kato (Tokyo Univ.).

Jun 2021 **Remote Online Sessions for Emerging Seismologists (ROSES)**
Summer course consisting of 11 online sessions (an introduction and 10 topical sessions related to seismology applications) organized by Fransiska Dannemann Dugick, Liam Toney, Suzan van der Lee, Nate Stevens and Anant Hariharan.

Sep 2020 **Seismic Risk in Puerto Rico – 1st Conservatory**
Webinar series by the UPRM-DHS Coastal Resilience Center of Excellence addressing seismic and structural engineering with the participation of Dr. Luis E. Suárez, Dr. Ricardo R. Lopez-Rodríguez, and Dr. Jose A. Martínez-Cruzado from Department of Civil Engineering and Surveying at the University of Puerto Rico, Mayagüez Campus.

Dec 2019 **NOAA Coastal Inundation Mapping Course**
A two-day intermediate level course with lectures and exercises in class to understand coastal inundation mapping methods using ArcGIS led by Matt Pendleton and Billy Brooks at the University of Puerto Rico, Mayagüez Campus organized by the Department of Civil Engineering and Surveying from this institution.

Sep 2015 **Society of Exploration Geophysicist (SEG): Geophysical Computing Workshop Series**
Introduction to the Linux/Unix operating system, shell scripting, and Generic Mapping Tools "GMT" held at the University of Puerto Rico, Mayagüez Campus.

May 2016 **Continuously Operating Caribbean Observational Network (COCONet) Workshop: Results, Sustainability and Capacity Building**
Community workshop organized by UNAVCO held in Punta Cana, Dominican Republic. (All travel expenses covered by UNAVCO)

May 2013 **Applied Geophysics using Ground Penetration Radar Workshop**
Lecture, field work using GPR equipment CMP/SmartCart and data processing with matGPR led by George Tsoflias from the University of Kansas at the University of Puerto Rico, Mayagüez Campus.

Mar 2013 **GSA Southeastern Section meeting in Puerto Rico**
Volunteer with the Department of Geology, University of Puerto Rico, Mayagüez

FIELD EXPERIENCE

Jun 2018 **US-China Collaboration on Landslide Research and Student Training**
Participated in the International Research Experience for Students (IRES) program hosted by the University of Houston (UH) in U.S. and the China University of Geosciences (CUG-Wuhan) in China funded by the NSF Award (OIA:1460034).

Collaborated with civil engineers in landslide research, training with LiDAR instrumentation and drone surveys,installation of GPS equipment, two-week intensive Chinese language and culture course at CUG-Wuhan campus, and a five-week field investigation within the Three Gorges Reservoir area including the exploration tunnel within Huangtupo landslide in Badong.

Mar 2016 **Miocene-Pliocene Carbonates Complexes of Southeast Spain Field Trip**
Participated in the University of Kansas (KU) and University of Puerto Rico, Mayagüez (UPRM) field trip led by Evan K. Franseen and Robert H. Goldstein from KU. (Received ExxonMobil Diversity Grant for UPRM).

Introductory lectures to Miocene carbonate complexes and regional geology of southeastern Spain required before fieldtrip. Field trip consisted of 1 week working with sequence stratigraphy and petroleum exploration in Almería, Spain.

Geophysics fieldwork techniques:

- Installation of Trimble GPS equipment (receivers, antennas and ancillary equipment).
- Electromagnetic survey using electromagnetic induction (EM) with small loops system of two coils (Geonics-EM34) to characterize ground conductivity.
- Seismic Refraction method using an array of geophones to locate a fault.
- Ground Penetration Radar (GPR) survey to locate a fault with Common Midpoint (CMP) technique separating antennas and reflecting profile technique using SmartCart.

COMPUTER SKILLS

Operative Systems: Macintosh, Windows, and Linux
Programming languages: Python
Experience in command-line interface and shell scripting
Experience in computer programs:

- GIPSY-OASIS II (processing GPS data)
- GMT (Generic Mapping Tools for creating maps and graphics)
- Matlab (familiarized with matGPR and TTBox toolboxes)
- QGIS & ArcGIS (Geographic Information System)
- OPUS, RTK and BNC (software for GPS data)
- Microsoft Suit: Word, Power Point and Excel

LANGUAGES

- Spanish (native)
- English (proficient speaking and writing)

AFFILIATIONS

- American Geophysics Union (AGU)
- Seismological Society of America (SSA)
- Golden Key International Honor Society